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CHEMICAL & ENGINEERING

NEWS

ALLELOCHEMICALS

Plants' own herbicides

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Cover: USDA's Gerald Leather cuts off a native wild sunflower leaf from which allelopathic compounds will be extracted. Photo by Eric H. Poggenpohl

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CHEMICAL & ENGINEERING
NEWS
APRIL 4, 1983

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processing was banned. The government would operate interim storage facilities until a permanent disposal repository became available. Congress, however, provided neither legislation nor funding. The utilities were stuck with rapidly filling spent-fuel pools and no additional storage capacity in sight, he says.

Vepco started making its own moves several years ago. In 1978 and 1979, it installed new storage racks in both the Surry and North Anna spent-fuel pools, effectively doubling capacity at both sites. It also developed a plan to ship spent fuel from Surry to first the North Anna 1 and 2 pool, and then to a new pool that would be built as part of a planned third North Anna unit.

Unfortunately for Vepco, Louisa County, in which North Anna is located, passed an ordinance that prohibited storing spent fuel in the county that wasn't generated in the county. Vepco challenged the ordinance in court, and a few weeks ago the courts ruled that the ordinance was invalid. The county, however, is appealing the decision.

Meanwhile, the company canceled plans for a North Anna 3 unit and lost the storage space that it would have supplied. Also, Congress passed the Nuclear Waste Policy Act, under which the government takes clear responsibility for permanent storage of spent fuel.

The problem, Smith says, is that the government has until 1998 to accept spent fuel, and Vepco's storage space at Surry could run out next year. Meanwhile, Vepco interprets the act as saying that responsibility for interim storage rests with those who produce the spent fuel. Although the act does provide federal interim storage, it isn't clear exactly who is eligible and how soon that storage will be available.

Vepco needs help next year. As a result, says Smith, the company has revised its plans once again. The new plan is designed to meet Surry's immediate needs and the company's longer-term storage requirements for all four of its nuclear units.

First, to avoid potential shutdowns, Vepco plans to double storage capacity at North Anna's pool by installing new, neutron-absorbing storage racks. It can't do this at Surry because the pool there won't take the added weight. And even the license application for the new North Anna racks is being contested by Louisa County and a citizens group.

In addition, Vepco plans to ship up to 500 spent-fuel assemblies from Surry to North Anna for interim storage. These shipments must begin next spring at a rate of about 30 shipments per year. The legality of these shipments still is in the courts, but Vepco is confident that the decision allowing it to ship will be upheld.

With reracking at North Anna and shipping from Surry, Vepco can extend its full-core discharge capability at Surry until 1990 and at North Anna until 1992. After 1990, however, the company will need still more storage space. This is where the proposed dry-cask storage, which will be used at Surry, comes in. Dry storage is expected to see the company through 1998, when permanent disposal likely will be available.

To raise the odds that dry-cask storage can be licensed in time to meet its 1990 requirements, Vepco plans to participate in two federally sponsored demonstration projects designed to prove the feasibility of dry-cask storage. But just in case, Vepco is designing and preparing license applications for an additional water storage pool at Surry. It's an expensive alternative—about $100 million to $125 million, according to Smith. But the company feels that it has to cover its flanks.

It also intends to try another new technology to cut costs and provide still more storage capacity. The technique is spent-fuel-rod consolidation, in which fuel rods are removed from their assemblies and placed in stainless-steel cannisters. Because a single dry cask can hold twice as much consolidated fuel as it can nonconsolidated fuel, only half as many casks would be needed at Surry. And, because the pool at North Anna can accommodate consolidation with little or no modification, its capacity could be nearly doubled.

With its long-term program of dry-cask storage and consolidation, Vepco will have enough spent-fuel storage capacity to meet its needs until the year 2005, Smith says. That's seven years after the government is scheduled to begin accepting delivery of commercial spent fuel for permanent disposal.

The technology, he says, is available for the most part. And the regulatory climate is favorable. However, he says, spent-fuel disposal is still a "highly emotional and politically volatile" issue. Although Vepco's latest plan sounds good, anything can happen to require still another revision.

Earl Anderson, New York

Gas prices to alter methanol, ammonia uses

Methanol and ammonia are chemicals at a crossroads. Traditional methanol uses are stagnant, and solid growth over the rest of the decade hangs on fuel-related applications that barely exist today.

Ammonia's fertilizer applications—which account for four fifths of consumption—will not even manage an average 2% per year growth between now and 1990. And because many nations will have cheaper natural gas than the U.S. after decontrol, methanol and ammonia, which together account for 9% of all natural gas used for industrial purposes in the U.S., will cost more when produced in the U.S. than when made overseas with inexpensive feedstocks.

These are some of the conclusions reached in a new study on the outlook for natural gas use in methanol and ammonia production in the U.S. conducted by Chem Systems, a Houston research firm.

According to Chem Systems, methanol imported from Canada, Mexico, the Middle East, and the Pacific Basin nations will make up an increasingly larger portion of the U.S. market, competing with U.S. product for the few segments that show growth. The methanol industry, which was still a net exporter in 1982, will be importing 18% of demand by 1985, and 19% by 1990. Ammonia, already a net importer, will develop along the same lines. Imports, which made up 8% of de-

mand in the 1981/82 season, will account for 11% in 1984/85 and 17% in 1989/90.

In making these and other forecasts, Chem Systems assumes that the overall long-term growth rate of the U.S. gross national product will average 3.2% in real terms; that U.S. and world crude oil prices will show no increase in 1983 and rise at only 2% per year in real terms after that; that there will be no natural gas price "fly up" in 1985 (on the assumption that indefinite escalator clauses in natural gas contracts will be legislatively constrained); and that the average free-market price of gas will come to equal that of low-sulfur residual fuel oil for major industrial and utility users with alternate fuel capability.

Since Chem Systems sees methanol's major traditional uses, formaldehyde, acetic acid, and others, as essentially mature, it expects real growth to come from the application of methanol as a motor fuel. Although there are major technical and infrastructure problems in the way, methanol's gasoline-related uses—whether as a straight fuel, in fuel blends, or in additives like MTBE (methyl *tert*-butyl ether)—are expected to grow at a 16.1% rate between 1981 and 1990. That would raise the gasoline-related sector's share of end uses from 17% to 28%.

By 1985, however, feedstock natural gas will represent more than 85% of the cash cost of producing methanol. On that basis, the report notes, the greater the difference between U.S. and overseas natural gas prices, the more vulnerable U.S. methanol producers will be to imports.

Ammonia producers are even more tied to natural gas than methanol makers. Whereas about 87% of U.S. methanol uses gas as a feedstock, 97% of ammonia is gas based. Rising gas costs combined with depressed ammonia demand and low-priced ammonia imports (some landed in the U.S. at prices below the feedstock cost alone for U.S. producers tied to expensive gas contracts) already have forced the permanent or temporary shutdown of about 20% of U.S. ammonia capacity over the past five years, and more plant closings are expected during the 1983/84 season. Chem Systems expects some plants to restart when demand picks up in 1984/85, but imports will supply most of the future growth in U.S. demand.

If it were not for the import threat, the report notes, the likelihood of rising gas prices in the U.S. pushing up ammonia prices would not be a serious marketing problem, since there is no good substitute for nitrogenous fertilizers. Because natural gas for feedstock and fuel will account for more than 83% of the production cost of ammonia by 1985, however, makers of cheaper ammonia overseas are expected to view the U.S. as an increasingly attractive market.

The greater presence of imports and marginal developments in energy efficiency actually will reduce the amount of natural gas consumed in ammonia production over the decade, Chem Systems predicts. As technical improvements bring gas consumption per metric ton of product down nearly 5 million Btu between 1981/82 and 1989/90, overall gas use in ammonia production will drop from 519 billion cu ft to 494 billion cu ft.

To a lesser extent, the same process is anticipated in the methanol industry. Gas consumption per gallon of methanol will be cut about 18,000 Btu over the same period. That will keep down overall gas use growth, seen as rising from 133 billion cu ft in 1981 to 159 billion cu ft in 1990. □

Fuel uses will dominate the methanol market . . .

Millions of gal unless otherwise specified	1981	1982[a]	1985[b]	1990[b]	Average annual change 1981–90
DEMAND					
Formaldehyde	430	360	500	560	3.0%
Acetic acid	140	140	190	270	7.6
Power generation	4	—	10	100	39.5
Gasoline-related	157	180	450	602	16.1
Others (DMT, solvents, methylamines, methyl methacrylate, methyl halides, etc.)	439	370	550	652	4.5
TOTAL	1170	1050	1700	2184	7.2%
SUPPLY[c]					
Production	1270	1200	1400	1760	
Net exports (imports)	100	150	(300)	(424)	
Natural gas consumption (average)					
Millions of Btu/gal	0.1234	0.1139	0.1073	0.1053	
Billions of cu ft	133.1	116.1	124.7	158.5	

a Estimate. b Forecast. Source: Chem Systems

. . . but fertilizer uses for ammonia will grow very slowly

Thousands of metric tons as N unless otherwise specified	1981/82	1984/85[a]	1989/90[a]	Average annual change 1981/82–89/90
DEMAND				
Fertilizer	11,652	12,476	13,761	1.9%
Fiber, resin, elastomer intermediates	884	1,060	1,341	4.7
Explosives	438	444	480	1.0
Livestock feed	90	120	145	5.4
Miscellaneous	1,109	1,350	1,510	3.5
TOTAL	14,173	15,448	17,237	2.2%
SUPPLY[b]				
Production	12,855	13,746	14,237	
Net exports (imports)	(1,094)	(1,700)	(3,000)	
Natural gas consumption (average)				
Millions of Btu/gal	41.252	38.364	36.446	
Billions of cu ft	519	501	494	

a Forecast. Source: Chem Systems